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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|----------------------------------------------------------------------------------------------------------------|-------------|----------------------|---------------------|------------------|
| 10/771,885 | 02/04/2004 | Yuan-Sheng Tyan | 85679AAJA | 3746 |
| 7590 | 03/15/2006 | | EXAMINER | |
| Paul A. Leipold Patent Legal Staff Eastman Kodak Company 343 State Street Rochester, NY 14650-2201 | | | WALFORD, NATALIE K | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2879 | |
| DATE MAILED: 03/15/2006 | | | | |

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|------------------------------|---------------------------------------|-------------------------|--|
| | 10/771,885 | TYAN ET AL. | |
| | Examiner Natalie K. Walford | Art Unit 2879 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 04 February 2004.

2a) This action is **FINAL**. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-18 is/are pending in the application.
4a) Of the above claim(s) _____ is/are withdrawn from consideration.
5) Claim(s) _____ is/are allowed.
6) Claim(s) 1-18 is/are rejected.
7) Claim(s) _____ is/are objected to.
8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on 04 February 2004 is/are: a) accepted or b) objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) Notice of References Cited (PTO-892)
2) Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 11/04.

4) Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
5) Notice of Informal Patent Application (PTO-152)
6) Other: ____.

DETAILED ACTION

Drawings

Figures 1 and 2 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). Corrected drawings in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "14c" has been used to designate both the light emitting part and hole transport layer in figure 4b. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "20" has been used to designate both absorption reduction layer and transparent conductive spacer layer on page 17 of the specification. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Objections

Claims 8 and 13 are objected to because of the following informalities:

Each claim should have only one sentence.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 1 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claim 1, no actual limitation is being applied to the thickness of the semitransparent electrode layer and the relative location of the light emitting layers. How can the luminance output of the present invention be compared to a similar top-emitting OLED device or bottom-emitting OLED device? What exactly constitutes a similar invention and what exactly is the luminance output? The Examiner also notes that the recitation of "the thickness of the semitransparent electrode layer and the relative location of the light emitting layers are selected to provide a luminance output of the microcavity OLED device at least 1.25 times that of a similar top-emitting OLED device or at least 1.75 times that of a similar bottom-emitting OLED device using similar OLED materials and having a transparent electrode in place of the semitransparent electrode" will not being given patentable weight because it is not considered to be a positive limitation.

Claims 8 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 8 and 13, the claims mention λ , but there is no definition of λ , in the claim. What do you mean by λ ? Is it one wavelength, a peak wavelength or any of a range of wavelengths i.e. bandwidth or other?

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3 and 5-18 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamada et al. (EP 1,154,676).

Regarding claim 1, Yamada discloses a microcavity OLED device in figure 4 including: a substrate (item 11); a bottom-electrode layer (item 12) disposed over one surface of the substrate; an organic EL element (item 13c) disposed over the bottom-electrode layer; and a top-electrode layer (item 14) disposed over the organic EL element, wherein one of the electrode layers is semitransparent and reflective and the other one is essentially opaque and reflective (page 5, paragraphs 31 and 34).

Regarding claim 2, Yamada discloses the microcavity OLED device claimed in claim 1 wherein one or both of the electrodes are metallic (page 5, paragraphs 31 and 34).

Regarding claim 3, Yamada discloses the microcavity OLED device claimed in claim 2 wherein metallic electrode(s) include metals or metal alloys selected from the group including Ag, Au, Al, and Mg (page 5, paragraphs 31 and 34).

Regarding claim 5, Yamada discloses the microcavity OLED device according to claim 2 wherein the metallic bottom-electrode layer is semitransparent and the light is emitted through the substrate (FIG. 23 and page 11, paragraph 81).

Regarding claim 6, Yamada discloses the microcavity OLED device according to claim 5 wherein the device further includes a high index absorption-reduction layer (Fig. 23, item 32) disposed between the semitransparent metallic bottom-electrode layer and the substrate.

Regarding claim 7, Yamada discloses the microcavity OLED device according to claim 6 wherein the absorption-reduction layer has an index of refraction greater than 1.6. The Examiner notes that Yamada does not expressly disclose the index of refraction, but it is inherent that the absorption-reduction layer (made from ITO) has an index of refraction. It is inherent for ITO to have an index of refraction of about 2, which is greater than 1.6.

Regarding claim 8, Yamada discloses the microcavity OLED device according to claim 6 wherein the thickness of the absorption-reduction layer approximately satisfies the equation

$$2n_A L_A + n_T L_T = (m_A + 1/2)\lambda,$$

where λ is the predetermined wavelength emitted from the device, n_A and L_A are the refractive index and the thickness of the absorption-reduction layer respectively, n_T and L_T are the real part of the refractive index and the thickness of the semitransparent metal electrode respectively, and m_A is a non-negative integer. It is preferred to have m_A as small as practical, usually 0 and typically less than 2.

The Examiner notes that the index of refraction of ITO has an index of refraction of about 2 and that the index of refraction of silver real pad is about 0.2 for the visible frequency range. Now L_A can be any value from 30 to 1000 nm according to paragraph

35. Now L_T can be any value from 5 to 50 nm according to paragraph 34. Choosing lambda to be 550nm, which this device is going to emit. One now gets

$$2n_A L_A + n_T L_T = (m_A + 1/2)\lambda = 2*0.2* L_A + 0.2 * 15 \text{ nm} = 3/2 * 550\text{nm}.$$

Regarding claim 9, Yamada discloses the microcavity OLED device according to claim 5 wherein the device further includes a transparent conductive spacer layer (page 9, paragraph 62) disposed between the semitransparent metallic bottom-electrode layer and the organic EL element or between the organic EL element and the metallic top-electrode layer.

Regarding claim 10, Yamada discloses the microcavity OLED device according to claim 2 wherein the metallic top-electrode layer is semitransparent and the light is emitted through the semitransparent metallic top-electrode layer (FIG. 4).

Regarding claim 11, Yamada discloses the microcavity OLED device according to claim 10 wherein the device further includes a high index absorption-reduction layer (FIG. 4, item 15) disposed over the semitransparent top-electrode layer.

Regarding claim 12, Yamada discloses the microcavity OLED device according to claim 11 wherein the absorption-reduction layer has an index of refraction greater than 1.6. The Examiner notes that Yamada does not expressly disclose the index of refraction, but it is inherent that the absorption-reduction layer (made from ITO) has an index of refraction. It is inherent for ITO to have an index of refraction of about 2, which is greater than 1.6.

Regarding claim 13, Yamada discloses the microcavity OLED device according to claim 10 wherein the thickness of the absorption-reduction layer approximately satisfies the equation

$$2n_A L_A + n_T L_T = (m_A + 1/2)\lambda,$$

where λ is the predetermined wavelength emitted from the device, n_A and L_A are the refractive index and the thickness of the absorption-reduction layer respectively, n_T and L_T are the real part of the refractive index and the thickness of the semitransparent metal electrode respectively, and m_A is a non-negative integer. It is preferred to have m_A as small as practical, usually 0 and typically less than 2.

The Examiner notes that the index of refraction of ITO has an index of refraction of about 2 and that the index of refraction of silver real pad is about 0.2 for the visible frequency range. Now L_A can be any value from 30 to 1000 nm according to paragraph 35. Now L_T can be any value from 5 to 50 nm according to paragraph 34. Choosing lambda to be 550nm, which this device is going to emit. One now gets

$$2n_A L_A + n_T L_T = (m_A + 1/2)\lambda = 2*0.2* L_A + 0.2 * 15 nm = 3/2 * 550nm.$$

This yields an L_A of 205 nm, which is in the allowed range. Therefore the thickness of the absorption-reduction layer approximately satisfies the equation

$$2n_A L_A + n_T L_T = (m_A + 1/2)\lambda.$$

Regarding claim 14, Yamada discloses the microcavity OLED device according to claim 10 wherein the device further includes a transparent conductive spacer layer (page 9, paragraph 62) disposed between the reflective metallic bottom-electrode layer

and the organic EL element or between the organic EL element and the metallic top-electrode layer.

Regarding claim 15, Yamada discloses the microcavity OLED device according to claim 2 wherein the bottom-electrode layer is the anode (Fig. 4, item 12) and the top-electrode layer is the cathode (FIG. 4, item 14).

Regarding claim 16, Yamada discloses the microcavity OLED device according to claim 2 wherein the bottom-electrode layer is the cathode and the top-electrode layer is the anode (page 9, paragraph 92).

Regarding claim 17, Yamada discloses the microcavity OLED device according to claim 2 wherein the bottom electrode is essentially opaque and reflecting and the OLED device is a top-emitting OLED device (FIG. 4).

Regarding claim 18, Yamada discloses the microcavity OLED device according to claim 2 wherein the top electrode is essentially opaque and reflecting and the OLED device is a bottom-emitting OLED device (FIG. 23).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamada et al. (EP 1,154,676) in view of Urabe et al. (US PUB 2003/0107314).

Regarding claim 4, Yamada discloses the microcavity OLED device according to claim 2, wherein the thickness of the semitransparent electrode layer is between 10 nm and 30 nm and being made of Ag (page 5, paragraph 34), but does not expressly disclose that both of the metallic electrode layers are Ag, as claimed by Applicant. Urabe is cited to show organic electroluminescent display device with an opaque and reflective metallic electrode layer that is Ag (page 3, paragraph 34). Urabe teaches that having Ag as the electrode layer helps to improve color purity and reflection (page 3, paragraph 42).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to modify Yamada's device to include both of the metallic electrode layers being Ag, as suggested by Urabe for helping to improve color purity and reflection.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Mitchell (Us PUB 2004/0007664) is cited to show and ITO electrode having an index of refraction of about 2 (page 3, paragraph 35).

Contact Information

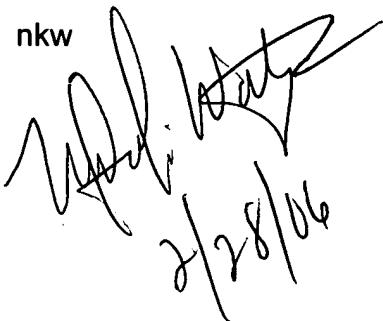
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Natalie K. Walford whose telephone number is (571)-272-6012. The examiner can normally be reached on Monday-Friday, 8 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimesh Patel can be reached on (571)-272-2457. The fax phone number for the organization where this application or proceeding is assigned is (571)-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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